Econ272a: Topics in IO

Lecture 5: Factor supply models: monopsonistic competition

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Readings

- *Lamadon, T., Mogstad, M., & Setzler, B. (2022). Imperfect Competition, Compensating Differentials, and Rent Sharing in the US Labor Market. American Economic Review, 112(1), 169-212.
- Kroft, K., Luo, Y., Mogstad, M., & Setzler, B. (2020). Imperfect competition and rents in labor and product markets: The case of the construction industry (No. w27325). National Bureau of Economic Research.

Worker vs. firm differentiation

- In the previous lectures, firms were differentiated, but workers not.
- Using BLP (1995) framework, can allow for worker variation in taste over wages and amenities
- But no unobserved variation in worker productivity
- IO demand literature: consumers can difference in taste, but they do not enter the production function
- Labor literature: strong focus on worker + firm differentiation (AKM, 1999)

Why does differentiation matter

- **Seller** differentiation:
  - Suppose vertical differentiation in inputs (workers, intermediate inputs, ...)
  - Input price variation can be due to quality or to markdowns
  - With production function, should pick up quality as different MPL..
  - .. but only limited number of inputs in PF
- **Buyer** differentiation:
  - Input price variation can be due to markdowns or due to buyer differentiation (non-wage amenities)

Oligopsony vs. monopsonistic competition

- Suppose we want to study aggregate welfare effects of factor market power.
- Approach 1: oligopsony model: Berger, Herkenhoff, Mongey (AER, 2019)
  - closely related to Atkeson Burstein (AER, 2008)
  - no worker heterogeneity, only firm heterogeneity
- Approach 2: monopsonistic model: Lamadon, Mogstad, Setzler (AER, 2022)
  - Topic of today's talk
- Not straightforward to get from aggregate markdown to welfare if due to firm differentiation. Love of variety! (cfr. markup debate)
- Also, other effects of (factor) market power than deadweight loss. Cfr. talk of next week.

Lamadon, Mogstad, Setzler (2022)

Overview

- Model of monopsonistically competitive labor markets
- Objectives:
  - Measure employer and employee rents with two-sided differentiation
  - Study efficiency effects of labor taxation
- Data: U.S. matched employer-employee data 2001-2015
- Model of monopsonistic competition
- Labor demand: horizontally and vertically differentiated employers set prices
- Labor supply: differentiated workers choose firms
- No price discrimination (motivation: asymmetric information)

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Model – supply primitives

- workers i, markets r, firms $j \in J_r$
- markets have many firms = no strategic interaction (monopsonistic competition)
- exogenous market structure
- worker utility

$$u_{it}(j, W) = \underbrace{\log(\tau W^{\lambda})}_{\text{after tax income}} + \underbrace{\log(G_j(X_i))}_{\text{amenities}} + \underbrace{\beta^{-1}\epsilon_{ijt}}_{\text{idiosyncratic preferences}}$$

- ϵ is nested logit distributed in cross section, Markov process in time series

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Model – demand primitives

- worker quality X, firms have worker distribution $D_{jt}(X)$of
- quality-adjusted labor at firm j:

$$L_{jt} = \int X^{\theta_j} D_{jt}(X) dX$$

- production function for value-added Y:

$$Y_{jt} = A_{jt} L_{jt}^{1-\alpha_{r(j)}}$$

- wage bill:

$$B_{jt} = \int W_{jt}(X) D_{jt}(X) dX$$

- profits:

$$\Pi_{jt} = Y_{jt} - B_{jt}$$

- productivity:

$$A_{jt} = \bar{A}_{rt} \tilde{A}_{jt} = \bar{P}_r \bar{Z}_{rt} \tilde{P}_j \tilde{Z}_{jt}$$

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Model – employee decision

- spot market for labor - no LT contracts
- ϵ is private info to workers, X is common knowledge
- worker observes $\mathbf{W}$ and chooses firm:

$$j(i,t) = \arg\max_j u_{it}(j, W_{jt}(X_i))$$

- wage index:

$$I_{rt}(X) \equiv \Big(\sum_{j' \in J_r} \left(\tau^{\frac{1}{\lambda}} G_{j'}(X)^{\frac{1}{\lambda}} W_{j't}(X)\right)^{\frac{\lambda\beta}{\rho r}} \Big)^{\frac{\rho r}{\lambda\beta}}$$

- conditional choice probability:

$$Pr(j(i,t) = j | X_i, \mathbf{W}_t) = \frac{I_{r(j),t(X)^{\lambda\beta}}}{\sum_r' I_{r't}(X)^{\lambda\beta}} \left(\tau^{\frac{1}{\lambda}} G_{j'}(X)^{\frac{1}{\lambda}} \frac{W_{j't}(X)}{I_{r(j)t}(X)} \right)^{\frac{\lambda\beta}{\rho r}}$$

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Model – employer decision

- # workers N with quality distribution $M(X)$
- assuming infinitesimal firms, labor supply function is:

$$S_{jt}(W, X) = NM(X) \frac{l_{r(j),t}(X)^{\lambda\beta}}{\sum_r' l_{r't}(X)^{\lambda\beta}} \left(\tau^{\frac{1}{\lambda}} G_{j'}(X)^{\frac{1}{\lambda}} \frac{W_{j't}(X)}{l_{r(j)t}(X)} \right)^{\frac{\lambda\beta}{\rho r}}$$

- firm chooses wages $W(X)$ for each quality level X that maximize profits:

$$\Pi_{jt} = \max_{W_j(X)} A_{jt} \left(\int X^{\theta_j} D_{jt}(X) dX \right)^{1-\alpha_{r(j)}} - \int W_{jt}(X) D_{jt}(X) dX$$

s.t.

$$D_{jt}(X) = S_{jt}(X, W_{jt}(X)) \forall t, j, X$$

- sorting: X-A complementarity, amenities can be correlated to productivity/technology

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Structural equations

$$w_j(x, \bar{a}, \tilde{a}) = \theta_j x + c_r - \alpha_r h_j + \frac{1}{1 + \alpha_r \lambda \beta} \bar{a} + \frac{1}{1 + \alpha_r \lambda \beta / \rho_r} \tilde{a}$$

$$y_j(\bar{a}, \tilde{a}) = (1 - \alpha_r) h_j + \frac{1 + \lambda \beta}{1 + \alpha_r \lambda \beta} \bar{a} + \frac{1 + \lambda \beta / \rho_r}{1 + \alpha_r \lambda \beta / \rho_r} \tilde{a}$$

$$b_j(\bar{a}, \tilde{a}) = c_r + (1 - \alpha_r) h_j + \frac{1 + \lambda \beta}{1 + \alpha_r \lambda \beta} \bar{a} + \frac{1 + \lambda \beta / \rho_r}{1 + \alpha_r \lambda \beta / \rho_r} \tilde{a}$$

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Rents

- How much rents captured by firms and workers?
- firm-level worker rent R_{it}^{w}:

$$u_{it}(j(i,t), W_{j,i(t),t}(X_i) - R_{it}^{w}) = \max_{j' \neq j} u_{it}(j', W_{j',t}(X_i))$$

- market-level worker rent R_{it}^{wm}:

$$u_{it}(j(i,t), W_{j,i(t),t}(X_i) - R_{it}^{wm}) = \max_{j' | r(j') \neq | r(j(i,t))} u_{it}(j', W_{j',t}(X_i))$$

- employer rents R_{jt}^{f} :

$$R_{jt}^{f} = \Pi_{jt} - \Pi_{jt}^{pt}$$

with Π_{jt}^{pt} being the profit if the firm is a price-taker (perfectly elastic labor supply)

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Data

- US matched employer-employee data, 2001-2015
- Matching is important to have 'movers' (cfr AKM). change in wages when moving helps identify worker quality
- Employers: balance-sheet data, tax filing data
- Employees: earnings

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Identification: rents

- Identification: (i) rents, (ii) worker quality, technology (iii) amenities, worker preferences
- Rents depend on parameters $(\beta, \rho_r, \alpha_r)$ and data $(Y_{jt}, W_{it}, j_{it}, r_{it})$ From structural wage equations:

$$\frac{\partial w_j}{\partial \tilde{a}} \left(\frac{\partial y_j}{\partial \tilde{a}}\right)^{-1} = \frac{1}{1 + \lambda\beta/\rho_r}$$

$$\frac{\partial w_j}{\partial \bar{a}} \left(\frac{\partial y_j}{\partial \bar{a}}\right)^{-1} = \frac{1}{1 + \lambda\beta}$$

- Ideal experiment: shock productivity, look at how change in value added affects wages
- shock to $\bar{a}$ identifies β, shock to $\tilde{a}$ identifies ρ_r

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Identification: rents

- Still need to identify returns to scale α_r

$$E(y_{jt} - b_{jt} | j \in J_r) = -log(1 - \alpha_r) - log(\frac{\lambda\beta/\rho_r}{1 + \lambda\beta/\rho_r})$$

- This is labor share variation net of supply elasticity. Perfect competition downstream!
- Productivity not identified. But can rewrite

$$\frac{\partial w_j}{\partial \tilde{a}}(\frac{\partial y_j}{\partial \tilde{a}})^{-1} = \frac{\partial w_j}{\partial y_j}$$

$$\frac{\partial w_j}{\partial \bar{a}}(\frac{\partial y_j}{\partial \bar{a}})^{-1} = \frac{\partial w_j}{\bar{y}_j}$$

- Again, relying hard on perfect competition downstream

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Identification: rents

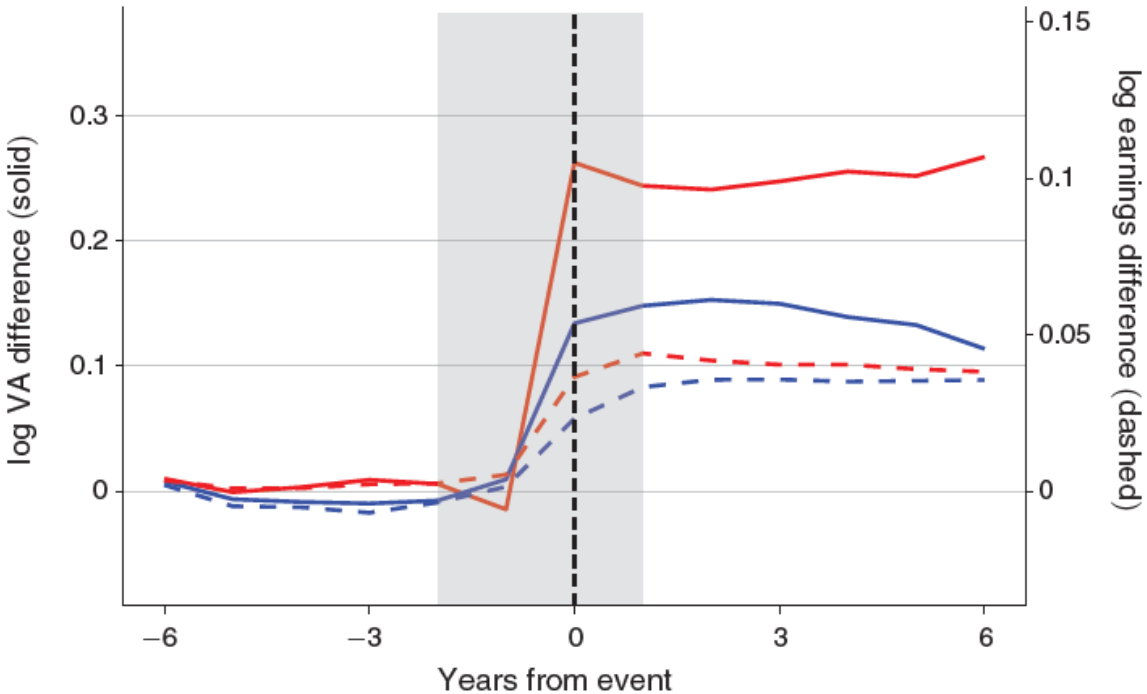

FIGURE 1. DID REPRESENTATION OF THE ESTIMATION PROCEDURE

- Red lines: market-level change
- Blue lines: firm-level change
- Importance of monopsonistic competition assumption

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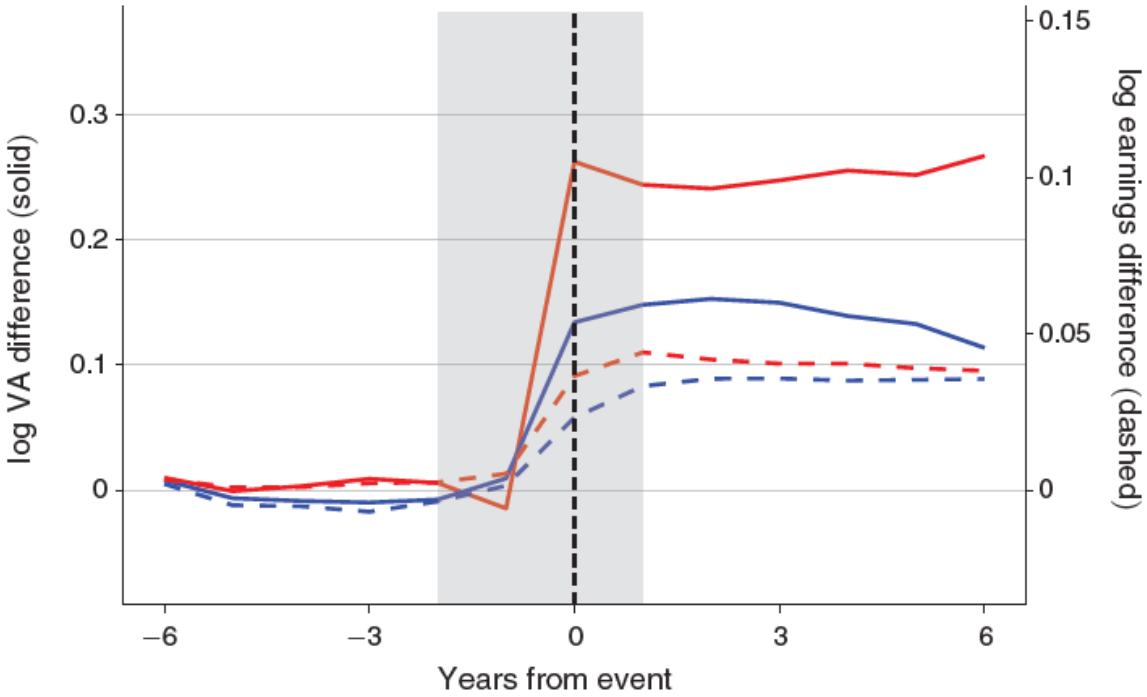
Identification: rents



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Identification: worker quality

- Filter wages from persistent earning variation at firm- and market-level to get w^a

$$w_{it}^a = \theta_j x_i + \psi_j$$

$$\text{with } \psi_j = c_r - \alpha_r h_j + \frac{1}{1+\lambda}\tilde{p}_r + \frac{\rho_r}{\rho_r + \lambda\beta}\bar{p}_j$$

- Estimate θ_j, ψ_j by looking at movers from j to j':

$$E[(\frac{w_{i,t+1}^a}{\theta_{j'}} - \frac{\psi_{j'}}{\theta_{j'}}) - (\frac{w_{i,t}^a}{\theta_j} - \frac{\psi_j}{\theta_j})]$$

- Then, can estimate worker quality x_i as residual of wage equation

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Estimation

- Define nest as commuting zone x 2-digit industry code
- Discretize amenities
- Internal instruments: firm- and market-level VA shocks with MA(1) model
- External instruments: Procurement auction shocks in construction sector + shift-share value added shock

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Results: rents

TABLE 3—ESTIMATES OF RENTS AND RENT SHARING (NATIONAL AVERAGES)

	Rents and rent shares			
	Firm level		Market level	
Workers' rents				
Per-worker dollars	5,447	(395)	7,331	(1,234)
Share of earnings	13%	(1%)	18%	(3%)
Firms' rents				
Per-worker dollars	5,780	(1,547)	7,910	(1,737)
Share of profits	11%	(3%)	15%	(3%)
Workers' share of rents	49%	(4%)	48%	(3%)

Notes: This table displays our main results on rents and rent sharing. Standard errors are in parentheses and are estimated using 40 block bootstrap draws in which the block is taken to be the market.

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Results: rents

TABLE 4—DECOMPOSITION OF THE VARIATION IN FIRM PREMIUMS

	Between broad markets	Within broad markets	
		Between detailed markets	Within detailed markets
Panel A. Preferred specification			
Total	0.4%	2.0%	3.1%
Decomposition			
Amenity differences	16.0%	7.8%	7.1%
TFP differences	15.5%	11.9%	8.6%
Amenity-TFP covariance	−31.1%	−17.7%	−12.6%
Panel B. Log-additive fixed effects specification			
Total	0.6%	2.8%	6.6%
Decomposition			
Amenity differences	15.7%	6.5%	7.2%
TFP differences	14.6%	13.2%	10.0%
Amenity-TFP covariance	−29.8%	−16.9%	−10.5%

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Using the model

- Estimated model can be used to quantify compensating differentials, sources of wage inequality, and sorting
- Another interesting use is to examine efficiency effects of labor taxation
- Two sources of inefficiency: taxation (within and cross-market), market power (cross-market only)
- Wages are taxed (progressively), amenities are not
- More progressive taxes (lower λ) make amenities relatively more valuable
- As a result, high-amenity firms get too many workers
- Optimal tax policy: not progressive + higher taxes for higher market power markets.

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Results - tax design

TABLE 5—CONSEQUENCES OF ELIMINATING TAX AND LABOR WEDGES

		Monopsonistic labor market (1)	No labor or tax wedges (2)	Difference between (1) and (2)
Log of expected output	$\log E[Y_{jt}]$	11.38	11.41	0.03
Total welfare (log dollars)		12.16	12.21	0.05
Sorting correlation	$\text{corr}(\psi_{jt}, x_i)$	0.44	0.47	0.03
Labor wedges	$1 + \frac{\rho_r}{\beta\lambda}$	1.15	1.00	−0.15
Worker rents (as share of earnings):				
Firm level	$\frac{\rho_r}{\rho_r + \beta\lambda}$	13.3%	12.4%	−0.9%
Market level	$\frac{1}{1 + \beta\lambda}$	18.0%	16.7%	−1.3%

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Discussion

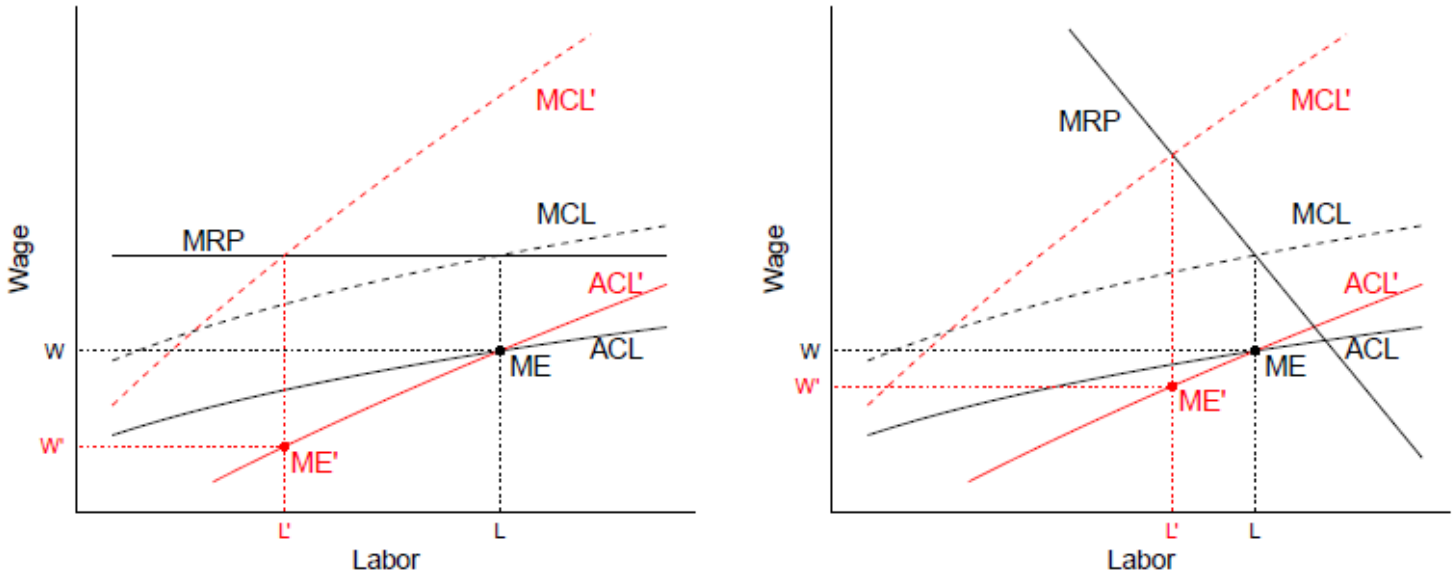
- Static model (no LT contracts etc)
- No strategic interaction
- No switching costs or search frictions
- No collective labor supply decisions
- Perfectly competitive product markets
- Wage change around moves = worker quality: only if markdowns identical within markets.
-

Kroft, Luo, Mogstad, Setzler (2020)

- Now also allow for imperfectly competitive product market
- Focus on construction industry
- Demand shocks: rely on marginally-won bids
- Richer production data and model

Kroft, Luo, Mogstad, Setzler (2020)

Interaction between product and labor market competition



(a) No Product Market Power ($\epsilon = 0$) (b) With Product Market Power ($\epsilon > 0$)

Figure 3: Impacts of Labor Market Power on Wages and Employment